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ENERGY ACTIVITIES (EXCLUDING FORESTRY) SUPPORTED BY

A.I.D. IN AFRICA SOUTH OF THE SAHARA

Office of Development Resources
Bureau for Africa
Agency for International Development

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INTRODUCTION

This report is an update as well as an expansion of the paper entitled "Fuelwood and Other Renewable Energies in Africa" written by Carol Ulinski in November 1979. ^{1/} It discusses the legislative and policy setting for the Africa Bureau's energy program and projects, and provides a narrative description, budgetary information and status on energy projects currently supported (or planned) by the Africa Bureau of AID.

The report is designed to give other AID bureaus and offices, private voluntary organizations and other aid donors, Congress and other interested people an overview of the Africa Bureau's energy activities. It is purely descriptive because most of the projects are just getting underway and in most instances it is too early to evaluate their results.

The information contained in the report was obtained primarily from AID project and budgetary documentation and files provided by the Selected Development Problems Division and the Country Project Officers of the Office of Development Resources. ^{2/}

I. THE LEGISLATIVE SETTING

Since the Foreign Assistance Act of 1975, Congress has urged AID to assist developing countries meet their energy needs. In that Act Congress authorized programs to help developing countries alleviate their energy problems, listed energy as an example of rural infrastructure projects which AID should undertake and supported a program of intermediate technology development. ^{3/} AID's energy mandate was outlined in greater detail in Section 119 of the Foreign Assistance Act of 1977. This legislation called on AID to give particular attention to the promotion of "small-scale, decentralized, renewable energy sources for rural areas carried out as integral parts of rural development efforts." It went on to say that "these programs shall be directed at the earliest practicable development and use of energy technologies which are environmentally acceptable, require minimum capital investment, are most acceptable and affordable by the people using them, are simple and inexpensive to maintain and are transferable from one region of the world to another." ^{4/}

^{1/} Some of the information in the introductory section is based on the Ulinski report. The author wishes to acknowledge the contribution of Ms. Ulinski.

^{2/} Additional information can be obtained from the Selected Development Problems Division, Bureau for Africa, Room 2460, Agency for International Development, Washington, D.C. 20523.

^{3/} Public Law 94-161, H.R. 9005, 89 Statutes at Large 349, et. seq.

^{4/} Public Law 95-88, H.R. 6714, 91 Statutes at Large 937, et. seq.

Another energy issue which is of particular interest to Congress is the deforestation problem. The International Development and Cooperation Act of 1979 contained an amendment calling on AID to give emphasis to "community woodlots, agroforestry, reforestation and protection of watershed forests and more effective forest management" in dealing with this problem. This Act also broadened AID's energy assistance mandate by authorizing AID to spend "up to \$7 million for geological and geophysical survey work and to encourage the exploration for potential oil, natural gas and coal reserves in non-OPEC developing countries." 1/

The Africa Bureau has followed these legislative guidelines, particularly Section 119, in developing its energy program and projects.

The Africa Bureau's Energy Policy and Program

The Africa Bureau's energy strategy continues to be based on the Airgrams on energy in Africa and village firewood production sent to the field Missions in July and August of 1979. 2/ It has the following priorities:

- (1) Programs addressed to fuelwood production -- both large-scale plantations and village woodlots -- and fuelwood conservation -- improved wood and charcoal burning stoves and charcoal kilns.
- (2) Light, small-scale renewable energy applications suitable for rural African communities or families -- water supply, grain grinding, irrigation, handicrafts and other basic life functions -- to increase rural productivity and improve the quality of life.
- (3) Building African capacity to carry out research and development work in Africa on appropriate energy technologies. AID is assisting energy ministries and solar energy labs in several countries and is strengthening the energy work of rural development agencies in several others.

1/ Public Law 96-53, S.588, 93 Statutes at Large 360, et. seq.

2/ "Energy in Africa--AFR's Program Emphasis," AIDTO CIRC A-204, August 30, 1979 and "Village Firewood Production and Other Cooking Fuels," AIDTO CIRC A-157, July 3, 1979.

- (4) Assisting African countries to analyze the energy priorities of both their modern and traditional sectors through energy field surveys and national energy assessments. 1/

As indicated in the tables in Section III(2) the Bureau's renewable energy program, including fuelwood, has risen from practically zero in FY77 to nearly \$3 million in FY78, and to \$11 million in FY80. Nearly \$13 million is being requested for FY82. As is shown in the Summary Budget Table on page 7, the majority of this funding is being or will be spent on technical assistance, testing and demonstration and dissemination of technologies, roughly \$21 million, \$17 million and \$15 million respectively. Nearly \$13 million will be spent on training and over \$7 million will be spent on analysis and studies. These activities will result in the development and dissemination of over thirty technologies in over twenty countries -- all but those with the smallest aid programs. 2/ In some instances, energy components are being incorporated into existing projects in health, agriculture, education and rural development. In others, new undertakings are being supported.

In addition to project activities, special studies have been commissioned on such key energy problems as the economics of renewable energy systems, community forestry projects, community participation in African fuelwood surveys, and methods of evaluating energy projects. 3/

Special workshops have been held to share knowledge and experience on energy, forestry and fuelwood issues. In June 1978 the Bureau sponsored a "Workshop on Firewood in Africa." An African Solar Energy Workshop sponsored by the Bureau in May 1979 has led to the formation of a new Solar Energy Society for Africa. A workshop convened in Paris in November 1979 brought donor and African experts together to improve coordination of forestry and fuelwood activities. An AID/Peace Corps community fuelwood workshop held in Upper Volta in February 1980 strengthened collaboration between the two agencies and identified project opportunities.

1/ The Central Energy Office of the Development Support Bureau of AID (DS/EY) has recently initiated projects in conventional energy identification and support, conventional energy training, energy efficiency and conservation, and small decentralized hydropower, in addition to its project in energy policy and planning and other activities. The Africa Bureau plans to rely on the DS/EY program when this type of assistance is requested by an African country.

2/ See Appendix A.

3/ See French, David and Patricia Larson, "Energy for Africa: Selected Readings," Bureau for Africa, AID, Washington, D.C., September 1980.

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The Bureau has played a leading role in making the fuelwood/reforestation issue a key concern for the group of donors -- France, Belgium, Germany, Great Britain and Canada -- who have associated themselves as members of "CADA" (Concerted Action for Development in Africa). As the lead country, the U.S. is working with CADA members and African governments in identifying countries in which major fuelwood and community forestry programs might be undertaken. The Bureau has also been active in CILSS/Club du Sahel ecology and forestry activities. 1/

In December 1981 the Bureau convened a workshop on "energy, forestry and the environment" at which AID personnel exchanged views with African and Western experts on key issues and ways in which the Bureau can improve and expand its work in these fields.

In order to develop and carry out these activities more efficiently, the Africa Bureau has increased the size of its energy field staff. Both REDSOs 2/ in East and West Africa now have energy advisors on contract.

III. PROJECT DESCRIPTIONS AND BUDGETARY AND OPERATIONAL STATUS

This section reviews both the regional and bilateral energy projects funded by the Africa Bureau. Environmental projects which include tree-planting and forestry management activities not specifically designated for fuelwood production and centrally funded projects are not included.

A brief explanation of AID's project documentation process, funding mechanisms and the categories and abbreviations used in the budgetary tables will help in understanding this report.

There are two major steps in the AID project development process:

- 1) A Project Identification Document (PID) is submitted by the AID Mission to Washington. This document includes a brief description of the proposed project and sufficient information to provide a basis for judging whether it is feasible and consistent with AID priorities;
- 2) If a PID is approved, a Project Paper (PP) is written. The PP provides a detailed description of the project, an analysis of the project's feasibility from social, technical, economic, environmental, and institutional perspectives, a plan for implementation and a detailed financial plan. The PP is reviewed either in Washington or the field, depending on the amount of the project, and if approved, the project is authorized, a project agreement is signed with the host country government and the funds are obligated.

Several of the energy projects have been funded under two regional, umbrella programs called the Accelerated Impact Program (AIP) and the

1/ The eight Sahelian countries most severely affected by the 1968-73 drought (Mauritania, Senegal, Mali, Niger, Chad, Upper Volta, the Gambia and Cape Verde) are represented by the CILSS, a regional coordinating organization based in Ouagadougou, Upper Volta.

2/ Regional Economic Development Services Organization.

Improved Rural Technology project (IRT). AIP's are small (\$500,000 or less), two-year pilot projects which can be quickly processed and meet the following conditions:

- It introduces a new technology;
- It provides for participation by local institutes and beneficiaries; and
- It provides for the transfer of productive skills and knowledge to beneficiaries.

The IRT project supports small (under \$100,000) projects which involve technology innovation by local organizations in such areas as agriculture, food processing, village water supplies, energy, construction and health.

The Energy Source and Activity categories used in the budgetary tables of this report are slight modifications of those developed by the AID Bureau for Program and Policy Coordination's energy advisor. Energy sources are defined as follows:

- Fuelwood (FW): trees planted to be used directly as fuel;
- Renewable energy (RE): direct solar, wind, small hydro, and biomass (charcoal, agricultural residues, animal wastes, etc.);
- Fossil fuels (FF): oil, gas, coal, oil shale, tar sands and peat.

The activities are defined as:

- Technical assistance (TA): the provision of skilled experts in a variety of fields to provide advice and training to carry out the project, both short- and long-term;
- Analysis and studies (AS): activities undertaken to compile or assess available energy sources, actual and uses, energy demand, and other studies, and evaluations (where a short-term consultant is hired specifically to do a study or evaluation, the budget for that person is included in this category);
- Training (TR): activities of a training nature, including in-service or academic training, observational tour training, workshops, public education activities and other promotional activities;
- Testing and demonstration (TD): activities undertaken to learn how a system works in a laboratory or a controlled field application;
- Dissemination (DS): activities undertaken with the primary purpose of disseminating technologies to expand the available supply of energy through production or increased efficiency.

The last two categories generally include funding for laboratory and other building construction, materials for prototype development, testing equipment, technologies, vehicles, infrastructure, operating costs, etc.

The Funding by Year table is as follows:

- FY78, FY79 and FY80 1/: These figures are actual obligations obtained from the Selected Development Problems Division and the Office of Development Planning of the Africa Bureau;
- OYBS1: This is the Operating Year Budget (OYB) for the project, which is subject to change during the year depending on the project circumstances and the Bureau's overall budgetary situation. These figures are maintained and updated on a regular basis by the Bureau's Office of Development Planning;
- CP82: This is the proposed funding level for each project which is submitted to Congress at the beginning of the budgetary cycle; it is likely to change drastically as the AID budget moves through the legislative process.

The Appropriation Categories (App. Cat.) are as follows:

- SH - Sahel Development Program
- SD - Technical Assistance, Energy, Research, Reconstruction
- FV - Agriculture, Rural Development and Nutrition, Development Assistance
- PH - Population Planning and Health, Development Assistance
- ES - Economic Support Fund

LOP stands for total funding over the Life-of-Project.

Note: All funding figures represent thousands of dollars.

1/ The AID fiscal year (FY) begins October 1 and runs through September 30.

A. AUTHORIZED/OPERATIONAL RENEWABLE ENERGY PROJECTS (in \$000)

Project No.	Country/Title	App. Cat.	Energy Source	LOP Authorization/Request by Activity						Funding by Year				
				TA	A&S	TR	T&I	DS	Total	FY78	FY79	FY80	FY81	FY82
698-0424	Africa Regional Energy Initiatives for Africa	SD	All	1,200	5,000	2,300	7,500	-	16,000	-	-	-	-	1,800
633-0209	Botswana Renewable Energy Technology Project	ESF	FW/RN	1,174	186	654	1,250	40	3,304	-	-	725	1,000	1,579
625-0937.03	Cape Verde Renewable Energy	SH	RN	-	85	22	388	-	495	-	-	500	-	-
603-0013	Djibouti Energy Initiatives	ESF		-	-	-	-	-	4,000	-	-	-	2,000	2,000
615-0205	Kenya Renewable Energy Development Project	FW/RN/FP		2,144	399	369	944	944	4,800	-	-	3,482	1,318	-
632-0206	Lesotho Renewable Energy Technology	SD	RN	783	-	219	403	195	1,600	-	1,600	-	-	-
698-0407.07	Liberia Mini-Hydro Electric Activity (IRT)	FN	RN	4	-	-	-	66	70	50	-	-	20	-
688-0217	Mali Renewable Energy	SH	RN	505	584	211	2,800	-	4,100	2,174	-	-	930	470
683-0235	Niger Solar Energy	SH	RN	63	-	72	365	-	500	500	-	-	-	-
698-0410.22	Rwanda Renewable/Improved Traditional Energy (AIP)	SD	RN	120	9	59	240	60	488	-	-	-	-	-
625-0937	Senegal Renewable Energy (AIP)	SH	RN	10	38	91	113	48	300	-	-	300	-	-
685-0208	Senegal Bakel Crop Production	FN	RN	-	75	-	625	-	700	700	-	-	-	-
650-0041	Sudan Village Renewable Energy	SD	RN	1,696	232	281	231	2,148	4,588	-	-	-	1,000	2,355
698-0407.09	Togo Rural Solar Technology Activity	FN	RN	-	-	-	-	50	50	-	-	50	-	-
698-0410.13	Upper Volta Solar Energy Demonstration (AIP)	SD	RN	24	17.5	-	38.5	-	80	80	-	-	-	-
SUBTOTAL				7,723	6,626	4,278	14,898	3,551	41,075	3,504	1,600	5,507	6,268	8,204

B. AUTHORIZED/OPERATIONAL FOSSIL FUEL PROJECTS (in \$000s)

Project No.	Country/Title	App. Cat.	Energy Source	LOP Authorization/Request by Activity					Funding by Year					
				TA	A&S	TR	T&D	DS	Total	FY78	FY79	FY80	FY81	FY82
695-0103	Burundi Alternative Energy-PEAT II	SD	FF	5,408	-	277	-	2,315	8,000	-	-	2,000	2,000	1,106
655-0005	Cape Verde Desalination and Power	SH/PH	FF	433	-	90	-	3,072	3,595	3,145	-	-	450	-
650-0039	Sudan Petroleum Training	SD	FF	-	24	176	-	-	200	-	-	200	-	-
SUBTOTALS				5,841	24	543	-	5,387	11,795	3,145	-	2,200	2,450	1,106

Country Project # Title	App. Cat.	Energy Source	LUP Authorization/Request-By Activity					Total	Funding by Year				
			TA	A&S	TR	T&D	DS		FY78	FY79	FY80	FY81	FY82
Africa Regional 698-0424 Energy Initiatives for Africa	SD	All	1,200	5,000	2,300	7,500	-	16,000	-	-	-	1,244	3,500

Project Purpose:

To develop and provide technically feasible, cost effective and socially acceptable options to Africa's present dependence on fossil fuels, improve availability of renewable energy sources, particularly fuelwood, and strengthen institutional capacity in Africa to meet the growing energy needs of rural and urban populations.

Project Summary:

The project will have five major components:

1. Planning, policy and evaluation - including surveys of energy resources and requirements, national energy planning, energy program and project development, and ongoing evaluation and comparative analysis of the effectiveness of projects;
2. Experimental pilot sub-projects - to develop and test the feasibility of technologies. This component is intended to supplement the regionally-funded Improved Rural Technology and Accelerated Impact Program mechanisms;
3. Training and institution building - including short and long-term training for staff members of host country institutions and regional organizations in national energy planning, and project development and implementation.
4. Conferences, workshops and studies - to promote and exchange information on energy issues, develop a network of renewable energy and fuelwood activities and their applications in Africa.
5. Pre-investment study - to conduct studies of the feasibility of establishing (or expanding) regional renewable energy research and training activities in Africa.

Host Country and Other Donors:

An African contribution of \$3,000,000 will be solicited.

Major Outputs:

1. Planning, policy and evaluation.
2. Experimental pilot sub-projects.
3. Training and institutional strengthening.
4. Conferences, workshops and studies.
5. Pre-investment study.

Status:

A Project Paper will be completed in February 1982.

Project Documents and Reports:

Project Identification Document,
November 14, 1980.

Country Project # Title	App. Cat.	Energy Source	LOP Authorization/Request-By Activity					Total	Funding by Year				
			TA	A&S	TR	T&D	DS		FY78	FY79	FY80	OY881	CP82
Botswana 633-0209	ESF	Fuelwood	587	93	327	625	20	1,652	-	-	725	1,000	1,500
Renewable Energy Technology Project		Renewable	587	93	327	625	20	1,652					
		Total	1,174	186	654	1,250	40	3,304					

Project Purpose:

a) To introduce village renewable energy technologies (RET's) which are easily reproduced and inexpensive, and b) to research, develop and put into use RET's which can reduce Botswana's dependence on vulnerable supplies of increasingly expensive fossil fuels.

Project Summary:

The project has the following components:

1. Baseline data collection on village and institutional energy use in three pilot districts, particularly on cooking and heating practices;
2. A three-month Village Awareness Campaign on the need to conserve wood, followed by construction of demonstration units -- earthen wood-burning stoves, solar ovens and solar water heaters, thatch insulation and evaporative coolers;
3. The introduction of small wind and hand-operated water pumps in eight villages;
4. Training of project personnel, extension workers, village entrepreneurs and other villagers in the construction and maintenance of the RET's;
5. Construction of a solar-heated and cooled building for the Botswana Technology Center (AID to finance one-third of the costs), four buildings at the Rural Industries Innovation Center, one passive solar house and three village training facilities;
6. Research and development on seven "institutional or commercial" RET's including solar water heaters, photovoltaic water pumps, wind-powered water pumps, pedal-powered sorghum dehullers and grinders, photovoltaic electric systems, woodlots and woodstoves; and
7. Energy assessments of either national or sub-sector issues.

AID will provide funding for two long-term technicians (renewable energy specialist and sociologist) and twenty-five person-months of short-term consultants, training, construction, commodities, and equipment and support costs.

Host Country and Other Donors:

The Government of Botswana will contribute \$1,178,300 to the project and the Peace Corps will provide five volunteers at a cost of \$225,000.

Major Outputs:

1. Information on energy use collected in three districts.
2. Village Awareness Campaign conducted and demonstration units built.
3. One-thousand domestic village technology units installed by villagers and entrepreneurs.
4. Eight small wind and hand pumps systems installed by farmers or village development groups.
5. RET project personnel, GOB extension workers, village entrepreneurs and others trained.
6. Nine project buildings constructed demonstrating RET potential.
7. R&D carried out on seven institutional and commercial RET's and at least two of these in use.
8. Botswana capacity to manage and implement ongoing extension, training, and research after the project.
9. Energy assessments completed.

Status:

The project was authorized on September 19, 1980 for five years. Implementation of projected contracted with Associates in Rural Development.

Project Documents and Reports:

Project Paper, April, 1980.

Country Project # Title	App. Cat.	Energy Source	UN Authorization/Request-By Activity					Funding by Year					
			TA	ABS	TR	T&D	NS	Total	FY78	FY79	FY80	FY81	FY82
Cape Verde 625-0937.03 Renewable Energy (AIP)	SH	Renewable	-	85	22	308	-	495	-	-	500	-	-

Project Purpose:

To provide the GOCV with R&D experience in non-fossil fuel energy systems as input to the formulation of a National Energy Plan which a) reduces reliance on fuel imports, and b) makes available local energy for the population.

Project Summary:

This pilot project will assist the Alternative Energy Workshop/Demonstration Center in analyzing energy needs, measuring resources, designing and manufacturing prototypes and testing performance and acceptability. Devices to be tested include wind-powered water pumps, hand and pedal water pumps, solar cookers, stills and dryers, biogas digesters, and wood stoves.

AID inputs include technical assistance, training and equipment, instruments and supplies, including relevant publications and journals. Short-term training will be provided for key staff persons in the U.S., through study tours to other countries and through participation in "hands on" workshops. The project will provide the short-term services of a wind specialist/power systems designer (two months), a solar engineer (six months), and a hand pump expert (one month). Project evaluation will also be provided.

Host Country and Other Donors:

The GOCV will provide land for the workshop, pay the salaries of local staff and operating costs totalling approximately \$133,000. Two Dutch technicians, financed by the UN or the Netherlands will be assigned to work on wind and other renewable programs for the lab. France, Church World Service, UNICEF, and Dutch church groups have all contributed to the wind program.

Major Outputs:

1. Wind and solar R&D facility operational.
2. Facility staff trained.
3. Data on wind/solar resources.
4. Prototypes constructed and tested.

Status:

The project was authorized on February 26, 1980 for two and a half years. It is now being implemented; commodity procurement now underway.

Project Documents and Reports:

- Project Identification Document, June, 1979.
- Project Paper, December, 1979.

Country Project # Title	App. Cat.	Energy Source	LOP Authorization/Request-By Activity					Total	Funding by Year				
			TA	AS	TR	T&D	DS		FY78	FY79	FY80	OY801	CP82
Djibouti 603-0013 Djibouti Energy Initiatives*	ESF	-	-	-	-	-	4,000	-	-	-	-	2,000	2,000

Project Purpose:

To assist the Republic of Djibouti in meeting its energy needs.

Project Summary:

The project will have four components:

1. A national energy sector analysis (NESA);
2. A fund to finance energy projects which will meet priority energy needs identified in the NESA, especially the energy needs of poor people;
3. Assistance as required to the Institut Supérieur des Etudes et Recherches Scientifique et Technique (ISERST); and
4. Other immediately identifiable interventions which could be utilized to contribute to the project goal and purpose.

Host Country and Other Donors:

Unspecified.

Major Outputs:

1. National Energy Sector Analysis.
2. Energy Development Fund.

Status:

PP completed 7/81. RFP published and is being contracted through Africa, REDSO/EA.

* Information based on Project Paper team Statement of Work. Energy sources and funding for individual project components have not been determined.

Country Project # Title	App. Cat.	Energy Source	LOP Authorization/Request-by Activity					Total	Funding by Year				
			TA	ABS	TR	T&D	DS		FY78	FY79	FY80	QY801	CP82
Kenya 615-0205 Renewable Energy Development Project	-	Fuelwood	1,030	133	223	622	622	2,630	-	-	3,482	1,318	-
		Renewable	514	133	73	322	322	1,364					
		Fossil Fuels	600	133	73	-	-	806					
			<u>2,144</u>	<u>399</u>	<u>369</u>	<u>944</u>	<u>944</u>	<u>4,800</u>					

Project Purpose:

To stimulate the development and dissemination of renewable energy technologies; promote and expand afforestation and fuelwood conservation efforts; support the institutional development of the Ministry of Energy; and assist in energy planning and petroleum conservation.

Project Summary:

The project has the following major components:

1. Initial planning and surveys - Provide a computer terminal and other assistance for national energy planning and a data bank and library;
2. Institutional development - Provide four long-term experts -- in afforestation, agroforestry, cookstoves and charcoal production, and renewable energy water pumping systems and short-term consultants in training, sociology, etc. to the Kenyan Ministry of Energy;
3. Applied research and demonstration - Help establish a network of nursery, species, research, and fuelwood/agroforestry demonstration and extension centers in Kenya's major ecological zones. Also, provide consulting assistance and initial capital for the establishment within the MOE of an Energy Development fund to provide loans and grants to government and non-government organizations for renewable energy projects and programs focused on Kenya's poor. Technologies to be financed include woodlots, agroforestry, improved wood and charcoal cookstoves, improved charcoal production, windmills for water pumping, hydraulic rams, animal and hand pumps, solar crop drying, and other small-scale renewable energy technologies;
4. Training - Provide on-the-job training for MOE counterparts, study tours to third countries for MOE and other Ministries' staff, workshops and other informal training for extension workers and villagers. Assistance will also be provided for curriculum development; and
5. Ongoing monitoring and evaluation of project progress.

Host Country and Other Donors:

The GOK is contributing \$1,700,000 to the project. A number of other donors have initiated or are planning energy projects in Kenya including the World Bank, the UNDP, the EEC, Germany, Japan, China, the UK, and Sweden, and efforts will be made under this project to coordinate with them.

Major Outputs:

1. Fifteen trained energy planning, conservation, and renewable energy staff for MOE.
2. Up to six nursery/extension centers established.
3. Energy Development Fund established.
4. Demonstration, dissemination and evaluation of renewable energy technologies.
5. Analysis and studies in national energy policy and programming completed.

Status:

Implementation awarded to Energy Development International. Team of two now resident in Kenya. Subcontracting and start-up activities are underway.

Project Documents and Reports:

Project Paper, August, 1980.

Country Project # Title	App. Cat.	Energy Source	LW' Authorization/Request-Ry Activity						Funding by Year				
			IA	A&S	TR	T&D	OS	Total	FY78	FY79	FY80	OY81	CP82
Lesotho 632-0206 Renewable Energy Technology	SD	Renewable	703	-	219	403	195	1,600	-	1,600	-	-	-

Project Purpose:

To meet expanding energy demand and conserve high cost, non-renewable energy resources, primarily among lower income groups, by developing and disseminating a set of renewable energy technologies (RET's) in selected rural areas and to establish the institutional basis for disseminating nationwide those systems found to be technically, socially and economically feasible through self-help, entrepreneuria) and government programs.

Project Summary:

This three-year pilot project will promote village-level energy conservation measures such as fuel efficient wood and dung burning and stoves, pedal powered grain grinding, thatch insulation and passive solar greenhouses, and undertake research and development on such technologies as anaerobic digesters and mini-hydroelectric production which seem technologically feasible, but are beyond the economic and technical capabilities of villagers.

A village-level process will be used to identify energy needs and select technologies to meet those needs. Villagers will be selected for training and will return to the village to set up demonstration units. Evaluation and feedback will be a central aspect of the project. Research and development will take place at a laboratory to be established by the project in Maseru.

AID inputs to the above activities include:

- **Technical assistance** - A program coordinator (physical scientist), field supervisor (social scientist), laboratory supervisor, administrative assistant, and a stock supply manager will be provided for three years, along with twenty months of short-term consulting.
- **Training** - Training will be provided for project staff, Peace Corps volunteers, Ministry of Rural Development counterparts, village energy technicians, and village participants. Curriculum and other training materials will be developed during the project.
- **Construction** - An energy conserving house will be built for the Project Coordinator for demonstration purposes.
- **Commodities and other support costs** to carry out these activities will also be provided.

Other Donors:

The Government of Lesotho will contribute \$77,000 to the project for project staff, office, laboratory and warehouse space. The Peace Corps will provide four volunteers over the life of the project.

Major Outputs:

1. Trained renewable energy staff in MOMB and in villages with link between them.
2. A village renewable energy technology implementation process established based on village definition of needs.
3. Introduction and evaluation of village RET's.
4. Construction and evaluation of R&D technologies.
5. An operational research and development laboratory.
6. Construction and evaluation of energy efficient house.

Status:

Associates in Rural Development have been selected to implement the project, Evaluation expected 2/82.

Project Documents and Reports:

Project Paper, August, 1979.

Country Project # Title	App. Cat.	Energy Source	LUP Authorization/Request-By Activity					Total	Funding by Year				
			TA	ABS	TI	T&D	IS		FY78	FY79	FY80	FY81	FY82
Liberia 698-0407.07 Liberia Mini-Hydro Electric Activity (IRT)	FN	Renewable	4	-	-	-	66	70	50	-	-	20	-

Project Purpose:

To design, install and evaluate an experimental 25-30 Kw micro-hydro electric power plant to provide two villages with a low cost, low maintenance source of electricity.

Project Summary:

The electricity will be used for water pumping, agricultural processing, lighting, refrigeration and other light industrial activities.

AID will contribute short-term local consulting in sociology and economics, the equipment and materials needed to construct the micro-hydro system and water pumping system. An AID engineer will assist the PCV on technical matters and monitor the project.

Host Country and Other Donors:

The GOL will contribute \$17,000 for equipment and vehicles. The participating community will contribute \$20,000, including labor and end-use equipment. The Peace Corps will contribute one volunteer.

Major Outputs:

1. Electricity and water supply system established.
2. Improved health conditions.
3. Increased lighting.
4. Mechanized agricultural processing.
5. Other light industries established.

Status:

Construction of the dam has begun and the villagers have raised money for a grain mill and other end-use equipment. Because of the difficult conditions in the region and transportation problems, etc., it is estimated that the system will not become operational until 1982.

Project Documents and Reports:

Project Activity Paper, January 16, 1980.

Country Project # Title	App. Cat.	Energy Source	LOP Authorization/Request-By Activity						Funding by Year				
			IA	AA5	III	TRD	DS	Total	FY78	FY79	FY80	FY81	FY82
Malawi 600-0217 Renewable Energy	SII	Renewable	505	504	210.6	2,000.5	-	4,100	2,174	-	-	930	470

Project Purpose:

The project is designed to improve the quality of life in Malawi, especially in rural areas, by providing energy for tasks which are now done by hand, to contribute to the alleviation of Malawian dependence on fossil fuels and firewood, and to gain a better understanding of the social and economic consequences of introducing renewable energy technologies in rural Africa.

Project Summary:

The project has four phases:

1. Material, technical and training support for the Malawian Solar Energy Laboratory, including R&D on solar water heaters, crop and fish dryers, wood stoves, and a photovoltaic battery charger;
2. Socioeconomic, and meteorological surveys in 25 villages;
3. Several devices and applications tested in several villages, including four photovoltaic-powered water pumps; and
4. Analysis and evaluation of the experiments.

AID Inputs Include:

- Technical assistance - An energy scientist (two years) and a social anthropologist (one year) will be provided along with short-term consulting in renewable energy, sociology and economics.
- Training - Short-term training in the U.S., support to Malawian educational institutions, and in-country training.
- Other costs include communities, vehicles, construction materials, equipment, etc.

Host Country and Other Donors:

The Government of Malawi will contribute \$1,134,000 to the project and the Peace Corps will contribute \$229,000 for volunteers.

Major Outputs:

1. Solar lab functioning with R&D plan completed.
2. Socio-economic and meteorological studies completed.
3. Functioning renewable energy devices located at selected village sites; devices monitored and evaluated.
4. Enhanced Malawian capability to carry out renewable energy program and projects.

Status:

The project was authorized on August 16, 1978 and in July, 1979 the Solar Energy Research Institute (SERI) in Golden, Colorado was appointed the implementing agency. While the project experienced a number of delays during its first year, implementation is now picking up speed, largely due to the arrival of the long-term project engineer in October 1980.

- Early start pumps - Funds have now been released so the pumps can be installed.
- R&D - R&D activities were begun by a short-term engineering consultant who was in Malawi from January to April of 1980. Draft R&D plans have been completed for woodstoves, solar dryers, cookers and ovens, wind, photovoltaic pumps and grinders. R&D on woodstoves is underway. In addition, a tentative schedule has been completed for short-term consulting to assist in carrying out these plans. Project evaluation scheduled for April 1982.
- Surveys - Several trips have been made to Malawi by the project anthropologist. On the energy-use surveys, a field pre-test has been completed, the survey has been revised, enumerators have been recruited and trained and the survey is underway. It is estimated to be completed in early 1982. Wind surveys are also underway.
- Training - Two Malawian engineers are undergoing training at Colorado State University and SERI.

The program has been extended to April, 1982.

Project Documents and Reports:

Project Paper, June, 1978,

Country Project # Title	App. Cat.	Energy Source	UN Authorization/Request-By Activity					Total	Funding by Year				
			IA	AGS	IA	TAD	DS		FY78	FY79	FY80	FY81	FY82
Niger 603-0235 Solar Energy*	SH	Renewable	63	-	72	365	-	500	500	-	-	-	-

Project Purpose:

To assist Niger's Office of Solar Energy (ONERSOL) to participate in an expanded program to develop, test and apply solar energy technologies, especially for the benefit of Niger's rural poor.

Major Outputs:

1. ONERSOL facility constructed.
2. Operational applied research in renewable technologies.
3. Advanced degrees.

Project Summary:

Project elements include: architectural design and construction supervision services for the new ONERSOL facility; provision of laboratory instruments and equipment; laboratory and field testing of solar water pumping systems, and to a lesser extent solar refrigerators, solar crop dryers and improved wood stoves; consultations and training courses by American experts and training in the United States for two ONERSOL employees.

Status:

The project was authorized on September 15, 1978. A new ONERSOL facility was completed and dedicated in December 1981. Technologies are being developed and tested. All of the equipment has arrived except two solar pumps. The Deputy of ONERSOL is studying at Howard University and is expected to complete his program in 1983.

Host Country and Other Donors:

The Government of Niger will contribute \$1,500,000 in addition to in-kind contributions.

Advances in technologies will be disseminated through a UNESCO-financed training program at ONERSOL.

Project Documents and Reports:

Project Paper, September 28, 1978.

* Formerly Project # 603-0039.

Country Project # Title	App. Cat.	Energy Source	LUP Authorization/Request-By Activity					Total	Funding by Year				
			TA	ABS	TR	TRD	DS		FY78	FY79	FY80	FY 81	FY 82
Rwanda 698-0410.22 Renewable/Improved Traditional Energy (AIP)	SD	Renewable	120	9	59	240	60	408	-	408	-	-	-

Project Purpose:

To assist the Government of Rwanda in support of institutional mechanisms and activities to improve its understanding of the country's rural energy needs and to conduct research, development, field testing and analysis of renewable and improved traditional energy technologies to meet those needs.

Project Summary:

Project activities include;

1. Dialogue with and surveys of three communities to determine their energy needs;
2. Training of Rural Energy Technicians selected from these communities;
3. R&D and testing, in the lab (CEAER) and in the field, of renewable water supply and irrigation, biogas refrigerators, mini-hydroelectric turbines, solar crop dryers, improved stoves and charcoal or brick kilns;
4. Establishment of a Rural Energy Fund;
5. Establishment of a project documentation and an international information exchange mechanism; and
6. Project evaluation.

AID inputs include:

- Technical assistance - A long-term project advisor and short-term consulting in renewable energy and sociology;
- Training - In-country and third country training for CEAER staff, and in-country training for university students and Rural Energy Technicians;
- Funding to establish the information exchange and library; and
- Other equipment and materials.

Host Country and Other Donors:

The Government of Rwanda will contribute \$177,000 to the project for CEAER staff.

Major Outputs:

1. Community energy surveys completed.
2. Technologies tested and installed in rural communities.
3. Rural Energy Technicians and CEAER staff trained.
4. Rural Energy Fund established and operating.
5. Project evaluation.

Status:

The project was authorized on August 31, 1979 for two years. Short-term consultancies by an energy technologist and by a survey expert have been completed. Equipment is beginning to arrive. A long-term project advisor arrived in August 1981. Evaluation early 1982.

Project Documents and Reports:

Project Paper, August 13, 1979.

Country Project # Title	App. Cat.	Energy Source	UN ¹ Authorization/Request-By Activity					Funding by Year					
			TA	A&S	IN	T&D	NS	Total	FY78	FY79	FY80	FY81	FY82
Senegal 625-0937* Renewable Energy (AIP)	SH	Renewable	10	38	91	113	40	300	-	-	300	-	-

Project Purpose:

To relieve the pressure on Senegal's fuelwood supply by promoting improved charcoal production methods, more efficient woodburning and charcoal cookstoves and simple solar fish dryers and storage tents.

Project Summary:

Project activities include:

1. Training heads of charcoal-making teams in improved charcoal production - the "Casamance Kiln" method;
2. Designing, developing, testing and disseminating more efficient cookstoves, with the cooperation of local women;
3. Training extension workers to build and demonstrate the stoves;
4. Developing and field testing several models of a "solar tent" fish drying and storage system to determine the most acceptable design for more widespread dissemination; and
5. Ongoing monitoring and evaluation.

AID inputs include short-term technical assistance and training in charcoal production, and stove and solar dryer construction and testing, and equipment and materials for prototype development and field testing.

Host Country and Other Donors:

The GAS will contribute 300,000 to the project for personnel, travel and office space. Two volunteers will be provided by the Peace Corps.

* Formerly project #685-0230.

Major Outputs:

1. Charcoal-makers trained.
2. Affordable, culturally acceptable wood-burning stoves disseminated.
3. Extension workers trained in stove building.
4. Solar tent drying and storage system developed, field-tested and evaluated.
5. Village artisans trained in solar dryer construction.

Status:

The project was authorized on October 15, 1979 for two years. More than 2000 stoves have been built.

The solar tent dryer and charcoal kiln activities are now getting underway.

Project Documents and Reports:

- PID (Overseas Development Council), March, 1978.
- Project Paper, October, 1979.

Country Project # Title	App. Cat.	Energy Source	INP Authorization/Request-By Activity					Funding by Year						
			IA	A&S	IN	T&D	US	Total	FY78	FY79	FY80	FY 01	FY 02	
Senegal 695-0208 Bakel Crop Production	FN	Renewable	-	75	-	625	-	700	700	-	-	-	-	-

Project Purpose:

To provide an experimental solar energy pump for pumping water for an irrigated agriculture scheme.

Project Summary:

The 30 KI pump, which will be capable of irrigating a 200-hectare area, will be installed near diesel irrigated perimeters in the Bakel area.

Provision has been made for careful monitoring and evaluation of the pump in technical, social, institutional and economic terms.

All will provide funding for technical assistance, hardware and studies and evaluation.

Host Country and Other Donors:

The Government of France is contributing \$625,000 to the project for the pump, part of the turbine system, site construction, system assembly and technical assistance. The Thermo-Electron Company is contributing \$170,000 for the solar collectors.

Major Outputs:

1. Solar thermal pump operational.
2. Evaluations completed.

Status:

The project was authorized on March 20, 1978, and implementation planning began in July 1978. Construction in Senegal began in late 1980.

The collector mounting structures are nearing completion and installation of the collectors should begin soon. Designs for all of the other components have been completed. The system is expected to be operational in mid 1982.

In March 1981 a U.S. contractor set up a monitoring and evaluation plan for the project.

Project Documents and Reports:

Project Paper Amendment, February 23, 1978.

Country Project # Title	App. Cat.	Energy Source	LOP Authorization/Request by Activity					Funding by Year					
			TA	AES	TR	T&D	OS	TOTAL	FY78	FY79	FY80	OY81	CP82
Sudan 650-0041 Sudan Village Renewable Energy	SD	Renewable	1,696	232	281	231	2,148	4,588	-	-	-	382	2,000

Project Purpose:

To assist the Government of the Sudan in developing applied research capability in rural renewable energy technology with verification through application of research results in village pilot projects.

Project Summary:

The project has two major activities:

1. Strengthening the institutional capabilities of the Institute of Energy Research (IER); particularly its Village Renewable Energy Unit (VREU); and
2. Funding renewable energy demonstration and dissemination activities coordinated by the Institute, but generally funded as sub-grants to PVO's.

Research projects include cold chains and heat for hot water for rural health care centers, village water systems, and local power systems using biomass conversion of agricultural wastes. Development and dissemination efforts will start with improved wood and charcoal stoves for cooking.

AID inputs include long-term technical assistance in management and village renewable energy and short-term assistance in various technical areas, long-term participant training in chemistry and communications, short-term training, observational tour training, commodities for minimally equipping the IER and the VREU and for research and demonstration projects, funding for an information center, surveys and environmental studies, operating support and other costs.

Host Country and Other Donors:

The GOS will contribute \$2,620,000 to the project and West Germany will contribute \$2,030,000. The Dutch are also interested in supporting renewable energy development in the Sudan.

Major Outputs:

1. Institute of Energy Research strengthened; staff trained.
2. Research conducted on several technologies.
3. Improved cookstoves and other technologies developed and demonstrated.

Status:

The PP was approved and authorized August, 1981. RPP has been publicized and proposal will be reviewed February - March 1982.

Project Documents and Reports:

- Sudan Village Renewable Energy, February, 1980
- Project Identification Document (Revised), February 24, 1981.
- Project Paper 8/31/81.

Country Project # Title	App. Cat.	Energy Source	ICM Authorization/Request-By Activity					Funding by Year					
			TA	A&S	TR	TRD	NS	Total	FY78	FY79	FY80	FY 81	FY82
Togo 69A-0407 Togo Rural Solar Technology Activity (III)	FM	Renewable	-	-	-	-	50	60	-	-	50	-	-

Project Purpose:

To stimulate the introduction of appropriate technologies in rural areas while taking the maximum number of precautions to avoid the frequent causes for failure of such initiatives.

Project Summary:

Solar dryers, hot water heaters and other small technologies, such as solar distillers and cookers, will be developed and constructed at the University of Benin Solar Energy Laboratory. This will be done under the supervision of the Laboratory Director who will also be the Project Director. Four solar dryers will then be installed in rural market centers and four solar hot water heaters will be installed in rural maternity centers. The other technologies will be demonstrated at appropriate rural gathering points. The rural population will be asked to assist in technology construction and will be responsible for its maintenance.

AIN will provide funding for the materials and equipment needed to construct and test the technologies.

Host Country and Other Donors:

The GNF will contribute the equivalent of \$5,000 to the project and local residents will contribute \$1,000 for materials and labor. The Togo Ministry of Mines, Energy and Hydrology will provide the services of a consulting engineer.

Major Outputs:

Four solar hot water heaters, four solar food dryers, and solar cookers and distillers installed in rural areas.

Status:

The project was authorized on March 25, 1980. Work on prototype development at the lab is progressing satisfactorily; however, there have been some delays in procurement. A study tour was made to Niger's solar lab -- OUFASOL -- by Benin Solar Energy Lab staff.

Project Documents and Reports:

Activity Paper, January 11, 1982.

Country Project # Title	App. Cat.	Energy Source	LOP Authorization/Request-By Activity			Funding by Year							
			TA	ARS	TH	T&D	NS	Total	FY78	FY79	FY00	FY 01	FY 02
Upper Volta 698-0410-13 Solar Energy Demon- stration (AIP)	SD	Renewable	24	17.5	-	30.5	-	80	-	-	-	-	-

Project Purpose:

To demonstrate, study and evaluate the potential of solar energy as a power source for such common village tasks as grain milling and water pumping, and to study the social and economic impact of this innovation.

Project Summary:

This AIP provides supplementary activities and funding for the Development Support Bureau regional project "Studies of Energy Needs in Food Systems." The Upper Volta sub-activity of this project -- a study of energy constraints to increased food production -- began in June, 1976. It was amended in September, 1978 to include a PASA with NASA Lewis Research Center to demonstrate a photovoltaic powered grain mill and water pumping system in the village of Tangaye, and a sociological study to gather baseline data. This AIP is a further amendment to the project for additional data collection, additional solar cells, a more powerful motor for the mill, materials for the milling building, a 5,000 liter water reservoir, supplemental technical monitoring and mid-term and final social impact evaluations. AID will provide technical assistance and training (through IASA), funding for the purchase and installation of the system and project evaluation.

Host Country and Other Donors:

The Government of Upper Volta will contribute \$15,000 to the project for extension assistance, site preparation, etc. The Tangaye villagers will contribute labor for mill building construction, site preparation and solar system installation.

Major Outputs:

1. Solar powered grain grinding and water pumping systems installed and operating.
2. Villagers oriented in management and upkeep of the system.
3. System for monitoring and repair.
4. Data collection system.
5. Study of the impact of labor-saving devices.
6. Study of the adaptability of a photovoltaic system in a rural Voltaic village.

Status:

The AIP was authorized on September 21, 1978. The solar system was installed, with the participation of the villagers in Tangaye in February, 1979 and became operational in March, 1979. An Upper Voltaic was hired to operate and maintain the system, and a Peace Corps Volunteer from the region was seconded to the project on a part-time basis. Several technical problems were experienced during the first six months of operation; however, since then it has operated fairly well. This good performance was due in part to significant amounts of outside technical assistance from AID/Duagadougou and NASA/Lewis. The GOLIY and the Tangaye villagers are very supportive of the project. Mid-term and final social impact evaluations have been completed. In October, 1980 it was decided that IASA would continue to provide technical assistance and spare parts to the project for two more years with funding from ST/EY. During this time Upper Voltaics will be trained in the operation and maintenance of the system so they can take charge of it.

Project Documents and Reports:

- Project Paper, September, 1978.
- Baseline Data Report, 1978.
- Mid-Term Evaluation, October 23, 1979.

Country Project Title	App. Cat.	Energy Source	LOA Authorization/Request-By Activity		Funding by Year									
			TA	MS	TR	TD	DS	Total	FY78	FY79	FY80	FY81	FY82	
Burundi 695-0103 Alternative Energy- Peat II	SD	Fossil Fuels	5,408	-	277	-	-	2,315	8,000	-	-	2,000	2,000	1,106

Project Purpose:

First, to conserve the country's forest reserves, upon which the overwhelming majority of the population relies for cooking and heating, by increasing the availability and acceptability of peat as an alternative energy source; second, to strengthen the Burundian agency that will be responsible for carrying out the project (ONATOUR).

Project Summary:

This project is the follow-on to Peat I, a pilot AID-funded activity that is now completed. It will give priority attention to consumers of charcoal, who are mostly urban households. However, artisanal, commercial, institutional and industrial markets will also be cultivated. The project anticipates the expansion of peat production largely through the introduction of appropriate machinery. The implementing agency, ONATOUR, is expected to become financially self-sufficient. In addition, a marketing strategy will be developed and implemented.

AID Inputs include:

- Technical assistance - A long-term headquarters team (three people) and a field production and maintenance staff will be provided (six people). Short-term technical assistance (36 months) will be provided in engineering, marketing, sociology, etc.
- Training - On-the-job training for counterpart staff and 24 months of third country training will be provided.
- Demonstration and publicity - Activities include cooking demonstrations, volunteer stove testing, radio and poster advertising.
- Equipment, vehicles and construction - Equipment and vehicles will be provided for the peat production operation and new offices will be constructed for ONATOUR.

Host Country and Other Donors:

The GRB will contribute \$1,089,000 to the project for land, operating costs, bog sites, etc. The Government of Ireland will contribute \$1,460,000 for training, survey work and technical assistance. As part of a larger project, the World Bank will be spending \$35,000 to test peat stoves in Burundi. Several other donors (EEC/FED, the Finnish and DANIDA) are assisting

Major Outputs:

1. Twenty-two ONATOUR staff members trained.
2. Improved ONATOUR management capability.
3. Resolution of technical questions on production and utilization of peat.
4. Development of commercial bogs.
5. Increased use of peat in urban domestic market.

Status:

The project was authorized on August 28, 1980, and is now underway. A contract is being negotiated with the Irish Peat Board to implement the project. VITA consultants assisted in design of improved peat burning stoves in November-December 1981.

Project Documents and Reports:

Project Paper, July 23, 1980.

Country Project # Title	App. Cat.	Energy Source	LOP Authorization/Request-By Activity					Total	Funding by Year				
			TA	AAS	TR	T&D	DS		FY78	FY79	FY80	FY81	FY82
Cape Verde 655-0005 Desalination and Power	SII/PII	Positi Fuel	433*	-	90	-	3,072	3,595	3,145	-	-	450	-

Project Purpose:

To provide a basis for continued economic growth and substantially improve the standard of living for the people of Sal Island by providing minimally adequate supplies of water and electric power throughout the island.

Project Summary:

The major features of the project include a centralized water and power production facility, transmission lines, distribution networks and a waste water removal system.

The technology is comprised of diesel engines driving electric generators, together with electrically-powered vapor compression desalination units.

AID will provide funding for construction of the power and desalination plant, and delivery systems along with technical assistance and training for Cape Verde staff.

Host Country and Other Donors:

The GOCV contribution includes all local costs for labor and materials, land for plant and irrigation sites and existing capital assets to be incorporated into the power distribution network totalling \$2,498,000.

* These figures represent 50% of the project's funds, those estimated will be spent on power generation.

Major Outputs:

1. A combined desalination/power facility capable of producing up to 750m³/day of potable water and 41,000 kWh per day of electricity.
2. A complete water delivery network to carry the plant output from plant site to header tanks in each of three communities.
3. A water distribution system within each of the three communities to deliver water to up to 1,300 households.
4. A sewage removal system for the three communities and sewage treatment for the two largest.
5. A power delivery network to provide energy to the transformers in the three communities.
6. A power distribution system for each of the communities to provide electricity to up to 1,000 households.

Status:

The project was authorized on March 24, 1978 and a contract was issued for design of the plant. Phase I of the design, completed by the contractor on November 30, 1979, projected that project costs would be nearly \$9 million greater than the amount authorized. Negotiations between USAID, the GOCV and the contractor resulted in a scale-down of the project and AID's agreement to authorize an additional \$900,000 and extend the project completion date to March, 1981. This additional funding was authorized on December 30, 1980.

Construction now underway.

Project Documents and Reports:

Project Paper, Surinco, 1977.

Country Project # Title	App. Cat.	Energy Source	LOP Authorization/Request-By Activity					Funding by Year					
			TA	A&S	TR	T&D	DS	Total	FY78	FY79	FY80	OY801	CP82
Sudan 650-0039 Sudan Petroleum Training	SD	Petroleum	-	24	176	-	-	200	-	-	200	-	-

Project Purpose:

To improve the managerial and planning capability of the Sudanese Petroleum General Administration by providing a training program for senior officials.

Project Summary:

Subjects to be covered in the course include management development and organization structure, operations management, financial management, human resources development, personnel management, and energy planning. The program will consist of part-time training in six segments over the course of a year.

The project will be implemented under a PASA between AID and the U.S. Department of Energy. DOE will conduct an end-of-project evaluation. AID will finance separately an independent evaluation.

Host Country and Other Donors:

The Sudan will contribute \$65,000 to the project for the first training segment and local costs of the project.

Major Outputs:

1. Thirty to forty-five members of PGA professional staff trained.
2. Training program evaluated.

Status:

The project was authorized on December 21, 1979 and the training program is underway. Baseline data was gathered in May, 1980. In August, 1980 the Sudanese Government, DOE and AID agreed that the original training program should be expanded in scope and extended. An AID-sponsored mid-term evaluation was also added and the end of project evaluation will take place before May 31, 1982.

Project Documents and Reports:

- Summary Project Paper, December, 1979.
- Baseline Evaluation, May 14, 1980.
- Mid-term Evaluation, Dec. 1980.

*not included
in R, D, T*

TECHNOLOGY

PROJECT

1. Solar water heaters for village dispensaries	688-0217 698-0407.09 633-0209	Mali Renewable Energy Togo Rural Solar Energy (IRT) Botswana Renewable Energy Technology
2. Solar thermal pump for irrigation	685-0208	Senegal Bakel Irrigated Perimeter
3. Photovoltaic pumps for irrigation and/ or drinking water	683-0039 688-0202 688-0217 698-0410.13 698-0410.22 633-0209 688-0213	Niger Solar Energy Mali Operation Mill Mali Renewable Energy Upper Volta Solar Energy Demonstration (AIP) Rwanda Renewable Energy and Improved Trad. Tech. Botswana Renewable Energy Technology Mali Action Ble
4. Windmills to pump water and/or generate electricity	625-0937.03 698-0410.22 615-0205 633-0209 682-0223	Cape Verde Renewable Energy (AIP) Rwanda Renewable Energy and Improved Trad. Tech. Kenya Renewable Energy Development Botswana Renewable Energy Technology Mauritania Alternative Energy ¹
5. Pyrolytic conversion of vegetable wastes	698-0135	Ghana Pyrolytic Conversion Demonstration ²
6. Pedal powered grain grinding and/or dehulling	632-0206 633-0209	Lesotho Renewable Energy Botswana Renewable Energy Technology
7. Photovoltaic battery charger	688-0217	Mali Renewable Energy

¹ PP, obligation and initial implementation scheduled for FY'01.

² Funded from Program Development and Support Funds.

TECHNOLOGY

8. Solar grain dryer

9. Solar Stills

10. Peat production

11. Peat stoves

12. Solar fish dryers

13. Improved charcoal production

14. Solar cookers

PROJECT

688-0217 Mali Renewable Energy
698-0410.22 Rwanda Renewable Energy (AIP)
683-0039 Niger Solar Energy
698-0407.09 Togo Rural Solar Energy (IRT)
615-0205 Kenya Renewable Energy Development
625-0937.03 Cape Verde Renewable Energy (AIP)

625-0937.03 Cape Verde Renewable Energy (AIP)
698-0407.09 Togo Rural Solar Energy (IRT)

698-0410.09 Burundi Alternative Energy-Peat (AIP)
695-0103 Burundi Alternative Energy-Peat II

695-0103 Burundi Alternative Energy-Peat II

688-0217 Mali Renewable Energy
625-0937.03 Cape Verde Renewable Energy (AIP)
625-0937 Senegal Renewable Energy (AIP)
685-0246 Senegal Renewable Energy II

625-0937 Senegal Renewable Energy (AIP)
685-0246 Senegal Renewable Energy II
615-0205 Kenya Renewable Energy Development

625-0937.03 Cape Verde Renewable Energy (AIP)
698-0407.09 Togo Rural Solar Energy (IRT)

¹ Scheduled for design and obligation in FY'81.

<u>TECHNOLOGY</u>	<u>PROJECT</u>
15. Solar greenhouse	632-0206 Lesotho Renewable Energy Technology
16. Solar thermal refrigerators for village dispensaries	603-0039 Niger Solar Energy 602-0223 Mauritania Alternative Energy ¹
17. Biogas refrigerators for village dispensaries	698-0410.22 Rwanda Renewable Energy (AIP)
18. Biogas digester	632-0206 Lesotho Renewable Energy Technology 625-0937.03 Cape Verde Renewable Energy (AIP) 602-0223 Mauritania Alternative Energy ¹
19. Mini hydro	632-0206 Lesotho Renewable Energy 698-0410.22 Rwanda Renewable Energy (AIP) 698-0407.07 Liberia Mini Hydro Electric Activity (IRT)
20. Pedal pumps for water	625-0937.03 Cape Verde Renewable Energy (AIP) 615-0205 Kenya Renewable Energy Development
21. Hand pumps for water	625-0937.03 Cape Verde Renewable Energy (AIP) 615-0205 Kenya Renewable Energy Development 633-0209 Botswana Renewable Energy Technology
22. Solar oven	633-0209 Botswana Renewable Energy Technology
23. Evaporative cooler.	633-0209 Botswana Renewable Energy Technology

¹ PP, obligation and initial implementation scheduled for FY'01

TECHNOLOGY

PROJECT

24. Thatch insulation	633-0209 632-0206	Botswana Renewable Energy Technology Lesotho Renewable Energy Technology
25. Passive solar heating and cooling	633-0209 682-0223	Botswana Renewable Energy Technology Mauritania Alternative Energy
26. Photovoltaic grain grinding	698-0410.13 688-0213	Upper Volta Solar Energy Demonstration (AIP) Mali Action Bie
27. Photovoltaic electricity production	633-0209 682-0223	Botswana Renewable Energy Technology Mauritania Alternative Energy
28. Hydraulic ram water pump	615-0205	Kenya Renewable Energy Development